

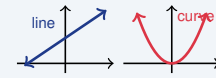
Linear and Nonlinear Functions

Name: _____ Date: _____ Score: _____ / 18

Quick Review and Helpful Hints

A *linear* function has a constant rate of change and graphs as a straight line; its equation looks like $y = mx + b$ (the variable is only to the first power). A *nonlinear* function (like $y = x^2$ or $y = \frac{1}{x}$) curves and changes its rate.

▶ **Example:** Is $y = 3x - 2$ linear or nonlinear? **Work:** The variable x is to the first power and the form is $y = mx + b$, so the graph is a straight line.
 ★ **Answer:** Linear



Linear = line; nonlinear = curve.

Practice Problems

Tell whether each function is Linear or Nonlinear.

- | | | | |
|---------------------------|-------|---|-------|
| 1. $y = 2x + 1$ | _____ | 8. $y = 2^x$ | _____ |
| 2. $y = x^2$ | _____ | 9. $y = 7 - x$ | _____ |
| 3. $y = -4x$ | _____ | 10. $y = \sqrt{x}$ | _____ |
| 4. $y = x^3 + 1$ | _____ | 11. Table $y: 2, 4, 6, 8$ (equal steps) | _____ |
| 5. $y = 5$ | _____ | 12. Table $y: 1, 4, 9, 16$ | _____ |
| 6. $y = \frac{1}{x}$ | _____ | 13. $y = x^2 - 2x$ | _____ |
| 7. $y = \frac{1}{2}x - 3$ | _____ | 14. $y = -x + 6$ | _____ |

Word Problems

15. A car travels at a constant 60 mph. Is distance vs. time linear or nonlinear? _____
16. A population doubles every year. Is that growth linear or nonlinear? _____
17. A function in the form $y = mx + b$ always graphs as what kind of shape? _____
18. The graph of $y = x^2$ is a curve. What is that curve called? _____



Answer Keys

- | | | |
|--------------|---------------|-------------------|
| 1. Linear | 7. Linear | 13. Nonlinear |
| 2. Nonlinear | 8. Nonlinear | 14. Linear |
| 3. Linear | 9. Linear | 15. Linear |
| 4. Nonlinear | 10. Nonlinear | 16. Nonlinear |
| 5. Linear | 11. Linear | 17. straight line |
| 6. Nonlinear | 12. Nonlinear | 18. parabola |

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Form $y = mx + b$, first power: linear. So the final answer is Linear.
2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is squared: nonlinear. So the final answer is Nonlinear.
3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = -4x$ fits $y = mx + b$: linear. So the final answer is Linear.
4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is cubed: nonlinear. So the final answer is Nonlinear.
5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A constant gives a flat line: linear. So the final answer is Linear.
6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is in the denominator: nonlinear. So the final answer is Nonlinear.
7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is First power, $y = mx + b$ form: linear. So the final answer is Linear.
8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is an exponent: nonlinear. So the final answer is Nonlinear.
9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = 7 - x$ is $y = -x + 7$: linear. So the final answer is Linear.
10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A square root curves: nonlinear. So the final answer is Nonlinear.
11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Equal steps mean a constant rate: linear. So the final answer is Linear.
12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Differences 3, 5, 7 change: nonlinear. So the final answer is Nonlinear.
13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Contains x^2 : nonlinear. So the final answer is Nonlinear.
14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Fits $y = mx + b$: linear. So the final answer is Linear.
15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Constant speed gives a straight line: linear. So the final answer is Linear.
16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Doubling is exponential: nonlinear. So the final answer is Nonlinear.
17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = mx + b$ graphs as a straight line. So the final answer is straight line.
18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = x^2$ graphs as a parabola. So the final answer is parabola.



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